REPORT ON ONE ACCIDENT OCCURRED IN A NUCLEAR MEDICINE DEPARTMENT IN ITALY

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1. ABSTRACT

One accident will be exposed occurred in the Nuclear Medicine Department of an oncological hospital, in which radioimmunotherapy with monoclonal antibodies (MoAbs) and/or peptides is performed. Both the physical and medical surveillance of the exposed workers were active in the hospital, and all the facilities for the safe manipulation of the radioactive substances were available.

Radioimmunotherapy procedures adopted in the hospital involved the labelling of MoAbs/peptides with large amounts (up to 15 GBq) of the radionuclide ^{90}Y, a pure β^--emitter (maximum energy of the β^--particles 2.27 MeV; half-life 2.67 d), in order to allow the treatment of 6-7 patients/week.

The labelling procedure was regularly performed inside a dedicated manipulation cell (*Eliza-beta*, manufactured by Comecer, Italy) shielded with plexiglas, and equipped with all the accessories (openings for the insertion of the hands, filtered extractor, telemanipulators, etc.) necessary for the safety of the operators.
^{90}Y, delivered by MDS Nordion S.A., was contained in liquid form (0.1 – 0.2 ml) in small glass vials, with a very high concentration (up to 150 GBq/ml). The more "critical" phase of the labelling procedure consisted in the manual transfer, by means of small microsyringes, of the radioactivity from the original vial to other vials containing the MoAbs or the peptides. During this phase of the procedure, that lasts no more than few minutes, the vials containing the radioactivity had to be hold by the operator with the left hand, using special pliers, 20 cm long.

The procedure was weekly performed by radiochemists or nuclear physicians, who had received an appropriate training. Each of these operators could not perform more than one procedure/month, and was regularly monitored (film-badges, TLD "ring" dosimeters, monitoring for the detection of external contamination, weekly control of the radioactivity in the urine). All the doses were always well within the dose limits prescribed for the exposed workers and no internal contamination was never recorded.

A few days after having performed a labelling procedure an operator, having observed a strong erythema on the fingertips of the thumb, index and middle finger of his left hand, limited to less than 1 cm^2 /finger, referred to the authorised physician, who immediately diagnosed a local radiodermatitis and requested the intervention of the qualified expert for the reconstruction of the events and for the evaluation of the dose.

The operator gave a complete co-operation, and revealed of having hold the vial not with the special pliers, but directly with the left hand, protected only with a very thin glove in lead rubber (0.1 mm Pb eq.) covered by a disposable glove normally used for avoiding the contamination. The skin lesions were strictly limited to the points of contact between the fingers and the vial; the estimated dose to these parts of the skin (based on the energy of the β-particles, the attenuation produced by the glass of the vial and the gloves and the referred total time of manipulation) was 12 Gy. An appropriate medical treatment was immediately adopted; the evolution of the lesions and their final repair, completely compatible with the estimated dose, is described. Four years after the event, only small telengiectasies (detected by capillaroscopy) are present.